Section 354 Activities

Division 35 Engineering Support Recompete

Pre-Proposal Conference

Main Product of Section

- **This Section is responsible for the planning, initiation and conduct of programs in mechanical, chemical, biological and robotic systems research and technology development, and for performing ground and space science experimentation to address the most challenging aspects of upcoming flights in the following 3 laboratory targeted areas:**
  - **large apertures**
  - **robotics**
  - **in-situ science**
- **Broad Technical Expertise Base**
  - **Robotic Systems, Advance Thermal/Cryogenic Systems, Biological and Chemical System, Advanced Structures, Extremely Low Temperature Systems**
- **Full Bandwidth Development**
  - **About even split between flight system development and research (science and technology development**

Activities

- **Multidiscipline mechanical systems technology for spacecraft, instruments, space interferometry systems**
- **Robotic sample acquisition and handling systems technology**
  - **Drilling, coring, “clean” sampling**
- **Impact Physics**
  - **Micro-meteor Protection**
  - **Return Sample Container design, analysis and test**
- **Cryogenic cooler development, characterization and applications**
  - **60 K TES, AIRS cooler (flight)**
  - **20K Planck sorption cooler (flight)**
  - **4K He sorption cooler (TPF)**
- **Low temperature science, flight systems, and experiments development**
  - **LTMPF, Facility class instrument for ISS**
  - **MISTE, First of two flight experiments for LTMPF**

Activities

- **Advanced cryo/thermal management concepts and materials for space instruments and microspacecraft**
- **Space deployable/inflatable structures including flight demonstrations**
  - **Large Radar Antenna, non-NASA funded**
- **Microdynamics characterization and active structures development in support of large-aperture and cryogenic opto-mechanical systems**
  - **SIM, NGST**
- **Applications of advanced materials to micro-actuators, and mechanisms**
  - **Electro-active polymers for biomemetic systems**
  - **Magnetostricive materials for precision light-weight optics (DART, ST-6)**
- **Applications of non-contact materials processing and characterization methods, and nondestructive evaluation methods to earth and space systems**
  - **Vibro-acoustic and ultrasonic methods for early cancer detection, micro-cracks in structures**
- **Applications of chemical and biological techniques to Planetary Protection and development of sensors and processes for space and terrestrial applications**

Activities

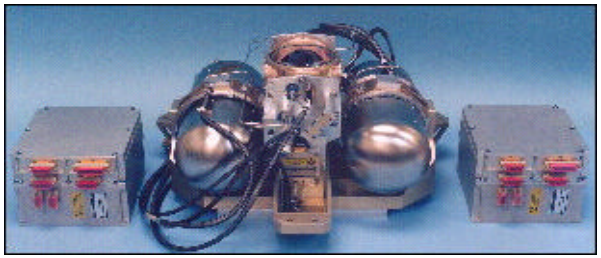
- **Applications of chemical and biological techniques to Planetary Protection and development of sensors and processes for space and terrestrial applications**
  - **Validation of Surface Cleanliness**
    - » **Microscopy**
      - **Epifluorescence Microscopy**
      - **Environmental Scanning Microscopy**
    - » **Commercially available microbial detection techniques**
      - **ATP**
      - **LAL**
      - **RNase**
      - **Quantitative PCR**
  - **Cleaning and Sterilization**
    - » **Materials performance and compatibility**
    - » **Dry Heat**
    - » **Plasma and Vapor H_2O_2**
  - **Science outgrowth**
    - » **Protein chemistry, Microbial ecology, Phylogenetics of microbial communities, Extremophile microbiology, Microbial physiology, Microbial genetics, Phage biology, Enzymology, Radiation biology, Molecular cloning**

What Main Products Were Developed With Outside Vendor Support ?

- Thermal Analysis for Cryogenic Hardware (eg., TES thermal analysis; all the CAD design work for PLANCK)

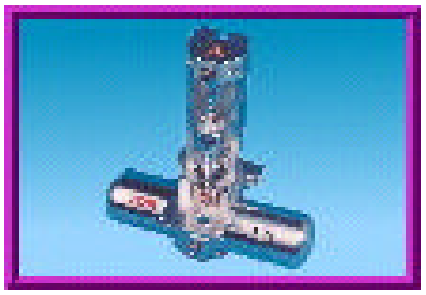
- Fundamental physics science experiments (CAD Drawings for the Dynamix and MISTE probe structure)

Cryo-Cooler Development



AIRS Cooler Development

Pulse Tube

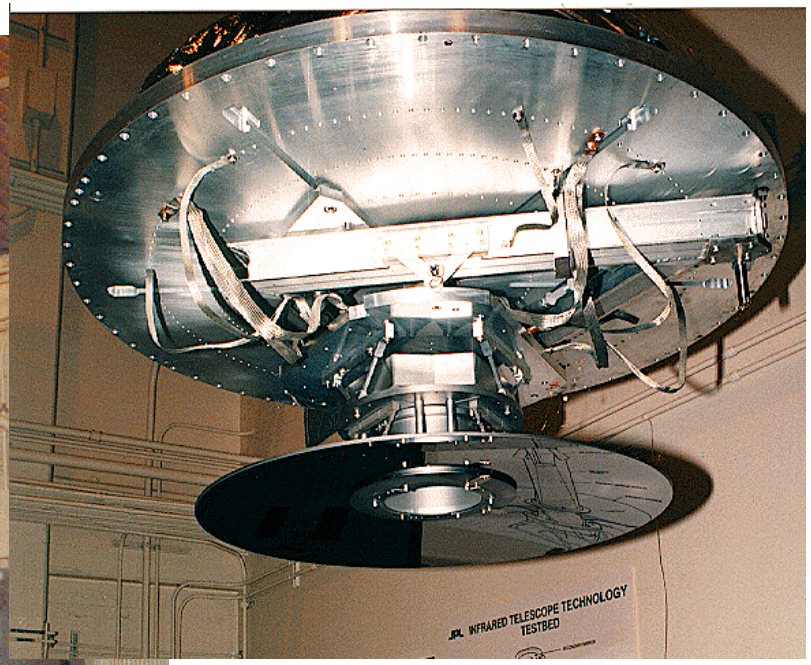


IMAS: Advanced Pulse Tube Cooler R&D

Cooler Integration Technologies

Cryocooler Characterization Testing

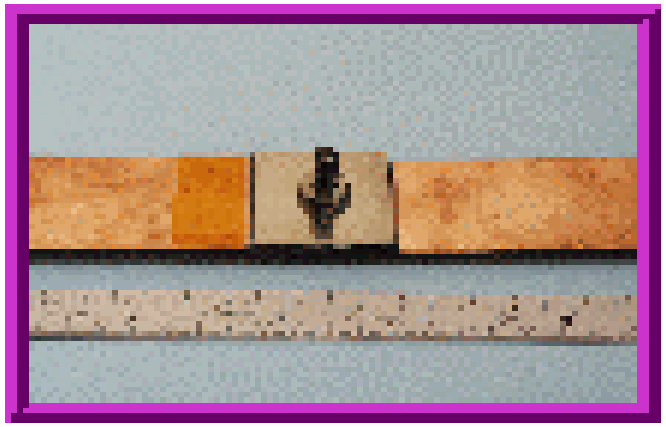
SIRTF Telescope Test Facility

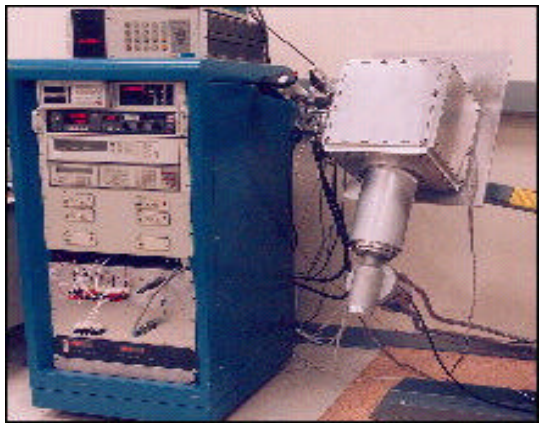


SIRTF Mirror

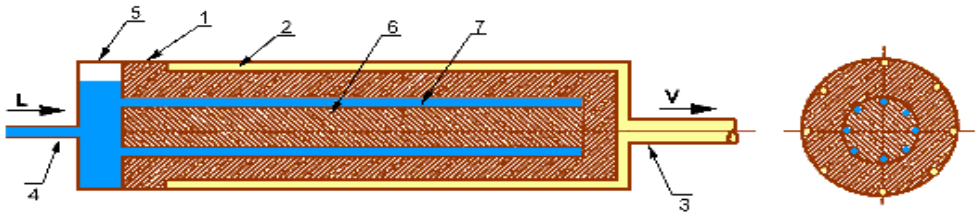
Telescope Test Facility

Thermal Material and Loop Heat Pipe Characterization





Thermal Material Characterization

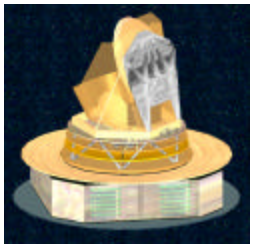


LHP Capillary Pump with Asymmetric Hydraulic Chamber

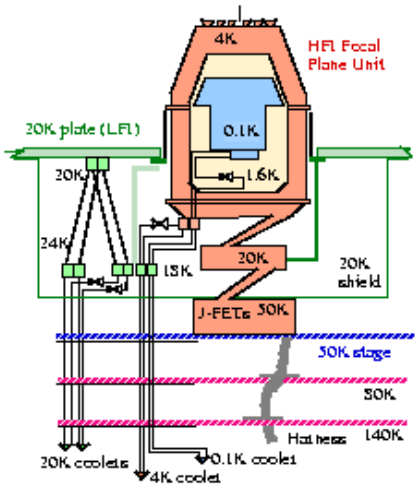
1-wick; 2-axial vapor removal channel; 3-vapor line; 4-liquid line;
5-compensation chamber; 6-secondary wick; 7-secondary channels

Loop Heat Pipe Characterization

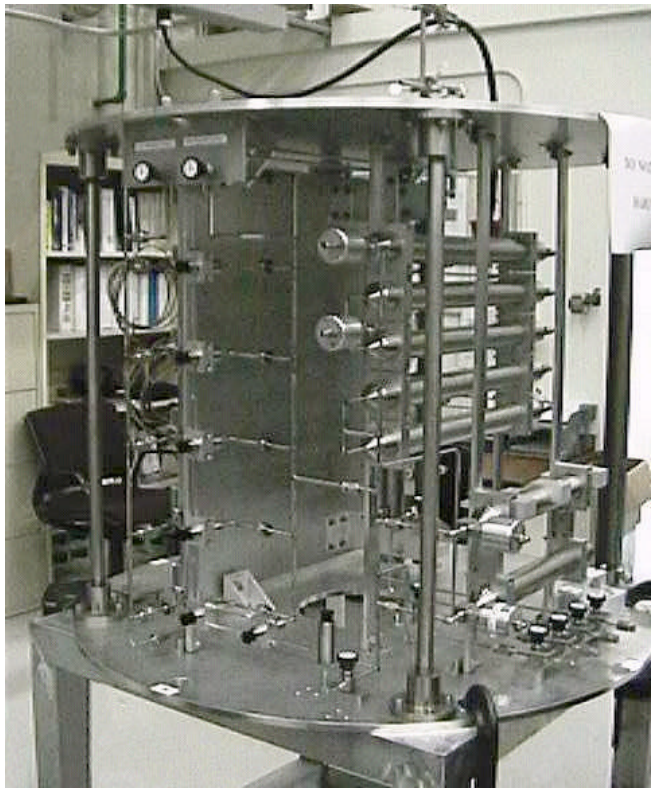
Planck Cooler Development



Planck Spacecraft

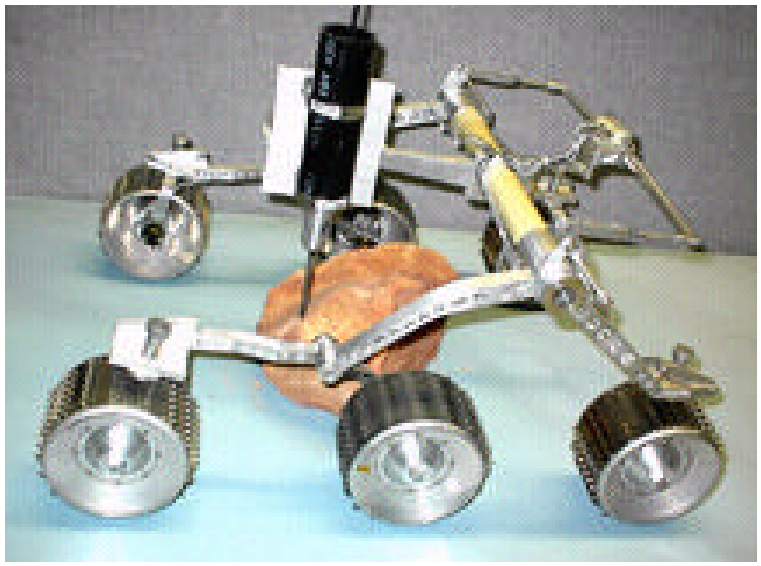


HFI Cooling System

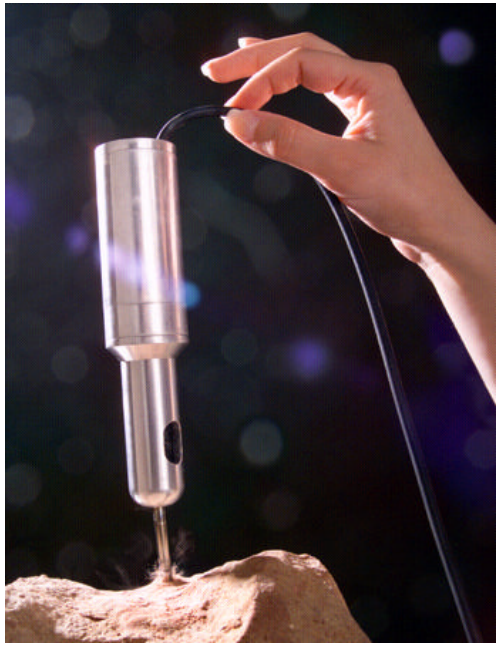


Planck Cooler

Ultra Sonic Drilling



The USDC operated from a Sojourner rover

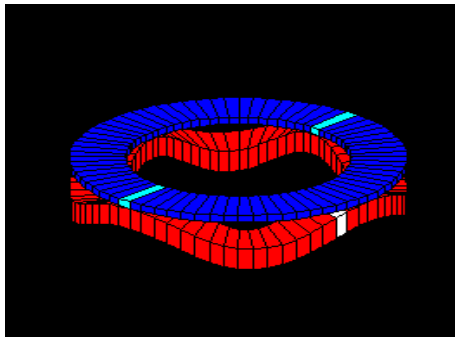


This new drilling technology does not require high axial load

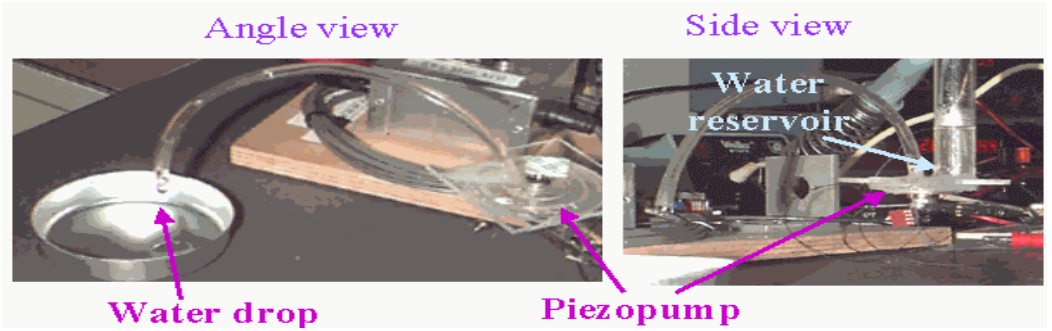
A view of URAT abrading a basalt layer

Non Destructive Evaluation and Artificial Actuation Activities

Photo of the ultrasonic high power transducer that is considered for diagnostics and medical treatment applications.



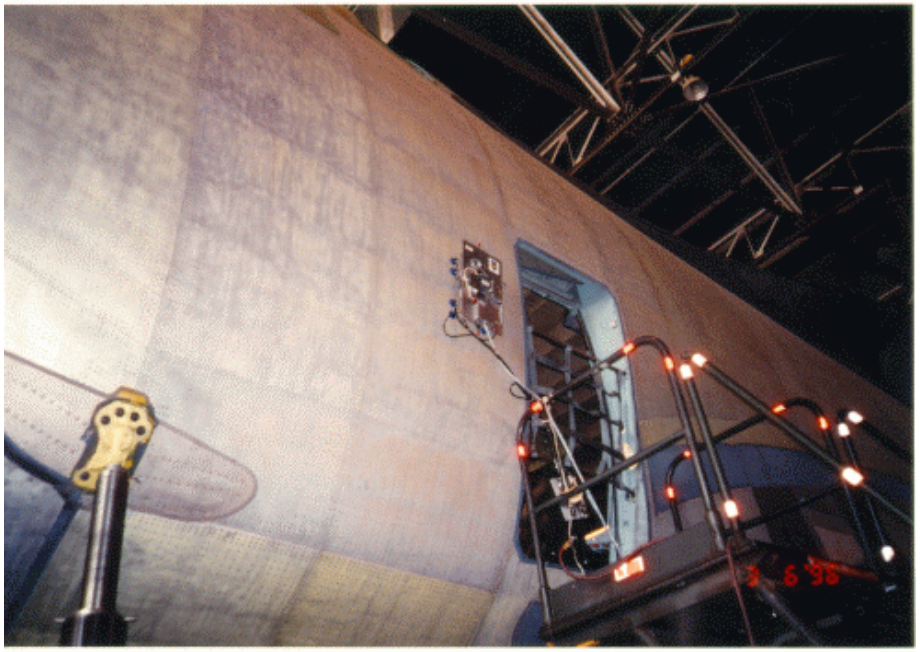
Ultra-Sonic Motors & Advanced Actuators



NDEAA's piezoelectric peristaltic pump

Non Destructive Evaluation and Artificial Actuation Activities

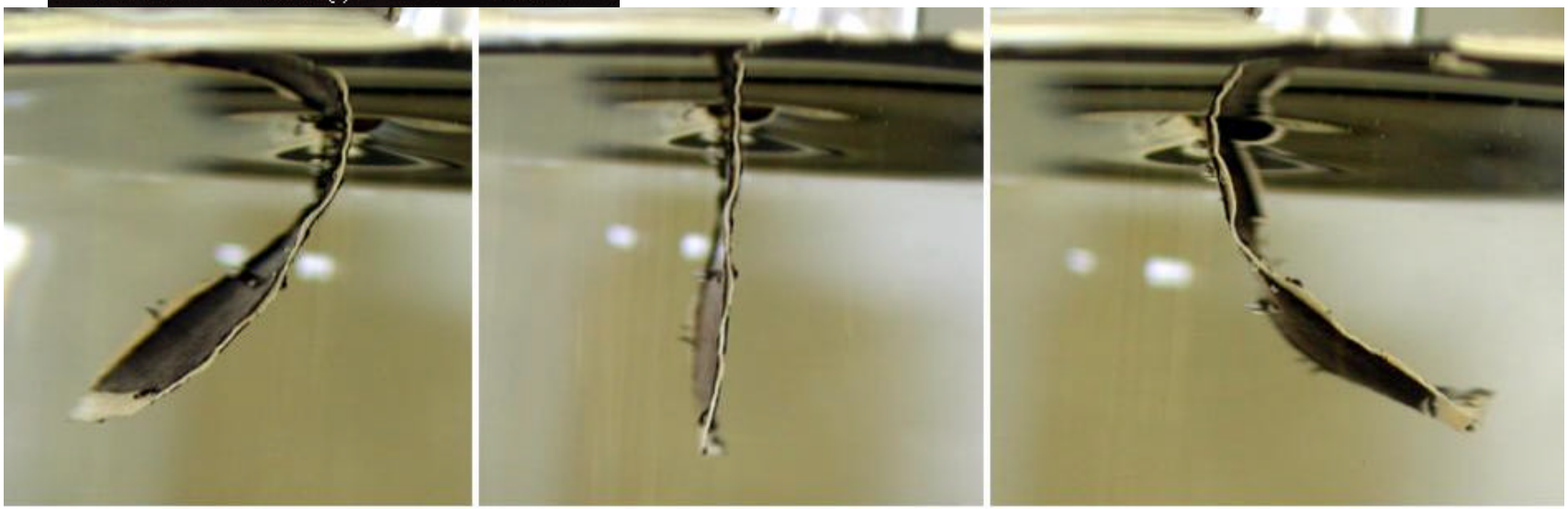
Non Destructive Evaluation



NDEAA Robotic Devices

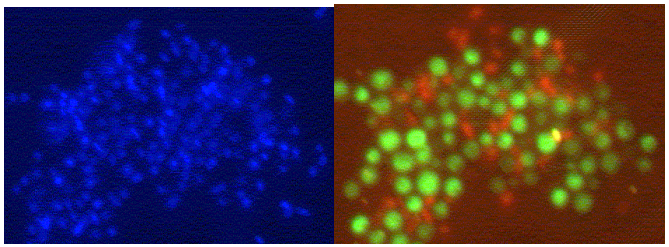
Electroactive Polymer

Electroactive Polymer Actuators: Artificial Muscles (NDEAA)

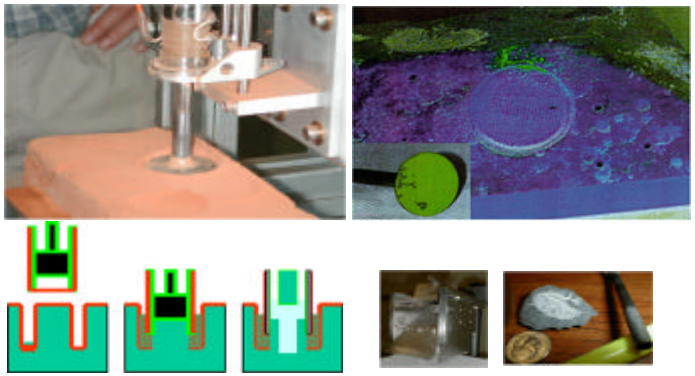


Conductive polymers at JPL (produced by Drs. Olazabal and Sansiñena)

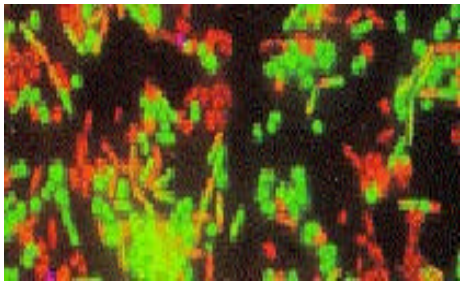
Cleaning, Verification, and Validation Techniques



Microbial characterization of cultivables, and non-cultivables



Contamination Free Sampling



Cleaning, Sterilization, and Validation Technologies for in situ life detection and sample return missions

Five years from now what will be different in your section, and why?

- **The LTMPF will be in the twilight years and we will be looking for other areas to grow.**
- **With respect to thermal (including cryogenic) and microdynamic technologies, there will be a growth in personnel, with increased involvement in both R&D and flight instrument projects.**
  - **Analysis support will probably still be needed in these areas**
- **There will be an expansion in R&D to subsurface robotic activities**
- **There will be a greater concentration of robotic R&D focused on small bodies and deep space, as well as Mars; plus there will be a greater concentration on networked robotic activities (planetary networked science for global surface access)**
- **There will be increased R&D efforts in the areas of micro-miniature system solutions and embedded, adaptive computing solutions (micro-botic explorers)**
  - **CAD support will probably be needed for the above two activities**
- **Biology and biotechnology will be larger and a more familiar part of JPL's base activities.**
- **Older facilities will have been improved significantly and there will be more people using them.**
- **The funding base for biology and biotechnology will be broader than it currently is (major funding now is almost entirely from the Mars program)**
- **Space inflatable systems will be demonstrated**
  - **CAD support may be needed for the above activity**